PLANNING FOR OYSTER RESTORATION IN THE FACE OF CLIMATE CHANGE

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The National Estuarine Research Reserves (NERRS) Science Collaborative is committed to sharing information about the projects we fund in the most effective way we can. Updates about this project will be communicated through nerrs.noaa.gov, webinars, conferences, and meetings. If you would like to stay in touch with this project, contact our program coordinator Cindy Tufts: cindy.tufts 'at' unh.edu.

For questions about the applied science aspect of this project, contact Matt Ferner, research coordinator at the San Francisco NERR: mferner 'at' sfsu.edu —or— Kerstin Wasson, research coordinator at the Elkhorn Slough NERR: kerstin.wasson 'at' gmail.com

For questions about the collaborative process being used to generate data and restoration planning tools that are relevant to intended users, contact Marilyn Latta from the Coastal Conservancy: mlatta 'at' scc.ca.gov

What's happening?

California's San Francisco Bay and Elkhorn Slough Reserves have teamed up with local partners to develop science-based tools to support native Olympia oyster restoration efforts in the face of climate change. The project will use an adapted version of the Joint Fact Finding method to create a flexible feedback loop between the team's scientists and the policy-makers and restoration practioners who need new planning tools to select native oyster conservation sites that will be successful under future climate conditions. Potential tools include web-based syntheses, decision-support tools, and/or interactive maps tailored to the needs of intended users. The team also plans to share lessons learned in a user-friendly synthesis for those working at local, regional, or international levels.

Why this project?

Oysters protect water quality, create habitat for ecologically and economically important species, and protect shorelines from extreme storms and erosion. Unfortunately, native oyster populations along the Pacific Coast are in decline, in part because of overharvesting and human activities that spread invasive species, increase sedimentation, and create low oxygen conditions in coastal waters. Oysters also may be threatened by climate-related changes in water salinity, temperature, and acidity—all of which can reduce their growth and survival.

Researchers deploy shell substrate for an oyster restoration experiment at the Elkhorn Slough NERR.

Over the past decade, this decline has prompted native oyster restoration projects in San Francisco Bay and Elkhorn Slough. Managers and decision-makers involved in these projects face the complex challenge of designing conservation and restoration strategies that will enable oyster populations to prove resilient as changes in climate interact with the influence of human activities to impact coastal ecosystems. Meeting this challenge requires planning tools that can answer questions such as...

- How does climate impact critical oyster resources?

- How does climate interact with human activities to affect critical resources for oyster populations?

- Does decreasing other human-induced stressors increase oyster resilience to climatic changes?

- Does the capacity for local oyster populations to adapt and spread beyond their population boundaries make them more resilient in the face of climate change?

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Olympia oysters are threatened by invasive species and other human-induced stressors. This project will study how human and climate related stressors combine to influence oyster survival. Left: Oysters can only survive at tidal heights above those tolerated by the invasive orange sponge. Above: Invasive tubeworms surround an oyster labeled so its growth and survival can be tracked.

How will this project work?

The multidisciplinary project team will explore the influence of human activities and climate change on native Olympia oyster populations. They will examine the intensity of human and climate-induced stressors, how these stressors interact, and how oyster populations respond to their influence. The team also will study how oyster populations connect to, and support, one another. To ensure that the science remains focused on relevant restoration questions and resulting tools are formatted and scaled in a useful way, the team has created explicit opportunities for stakeholders to engage:

- Fall 2011: The team collected feedback on project design, stressors of interest, study sites of greatest relevance, and the format and scale of restoration planning tools.

- Winter 2013: The team will solicit feedback on initial scientific results and interpretations and provide an opportunity for stakeholders to evaluate and improve draft restoration planning tools.

- Summer 2014: The team will offer a training on how to access and use restoration planning tools that incorporate final results of scientific assessments and lessons learned about shellfish restoration and climate change resilience.

The research is being conducted at two estuaries along the central California coast—San Francisco Bay, which is large, urban, and strongly influenced by freshwater, and Elkhorn Slough, which is small, agricultural, and weakly influenced by freshwater. Initial comparisons of sites within and between these estuaries show strong variation in stressors and oyster populations, extending the relevance of the results to other Pacific estuaries with a wide range of environmental conditions. The team will address the following specific questions:

- How do the spatial patterns of key environmental stressors vary within and between these estuaries?

- How do different stressors influence oyster survival and growth? Are negative impacts from climate-related stressors greater or lesser than those from other human-induced stressors? How do these different stressors interact?

- How do larval dispersal and recruitment interact with variation in environmental stressors over space and time?

January 11, 2012